

NASA TECH BRIEF

Langley Research Center



NASA Tech Briefs announce new technology derived from the U.S. space program. They are issued to encourage commercial application. Tech Briefs are available on a subscription basis from the National Technical Information Service, Springfield, Virginia 22151. Requests for individual copies or questions relating to the Tech Brief program may be directed to the Technology Utilization Office, NASA, Code KT, Washington, D.C. 20546.

A Stagnation Pressure Probe for Use in Supersonic Flow

A probe has been developed which is capable of recording true stagnation pressure in supersonic and subsonic flows.

In a supersonic stream, the probe decelerates a portion of the stream from supersonic to sonic flow by means of a compression fan which is generated by a curved compression surface. The compression surface is a section of a curved cylinder shown in Figure 1. The compression process within the fan is free from shock and is, therefore, isentropic. In a locally subsonic region downstream of the compression fan, a Pitot tube samples stagnation pressure.

The pressure recovery of the probe has been measured in several supersonic wind tunnels and is defined as the ratio of the pressure recorded by the probe to the

stagnation pressure of the free stream. In these tests the free-stream stagnation pressure was assumed to be equal to the stagnation pressure in the wind tunnel settling chamber. In Figure 2 the measured pressure recoveries are shown compared to those of a plain Pitot tube. The pressure recovery of the probe is essentially unity at Mach numbers up to about 2.2.

The variation of pressure recovery with flow misalignment has also been measured. As an example, at a free-stream Mach number of 1.88, a misalignment of 8° may be accepted without a significant change in the pressure recovery.

Static pressure orifices in the compression surface allow the probe to be used as a combined flow-direction and stagnation-pressure sensor.

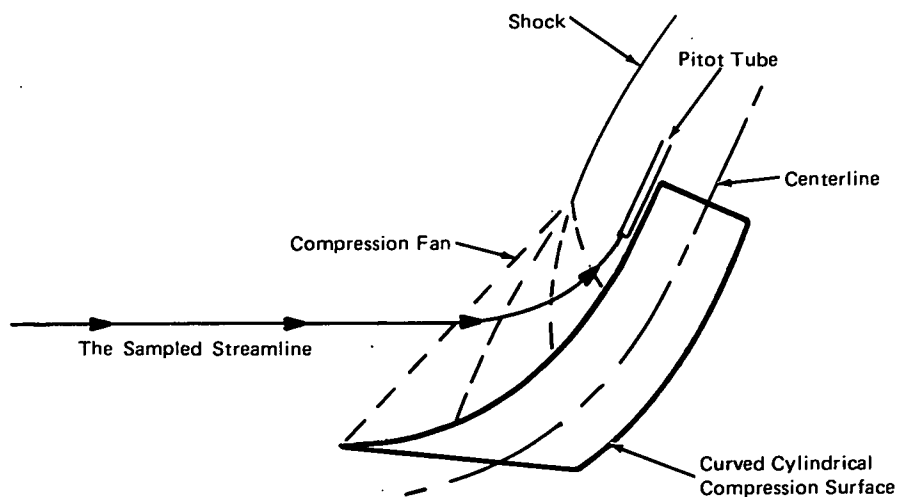


Figure 1. A Sketch Of The Flow Field Ahead Of The Compression Surface.

(continued overleaf)

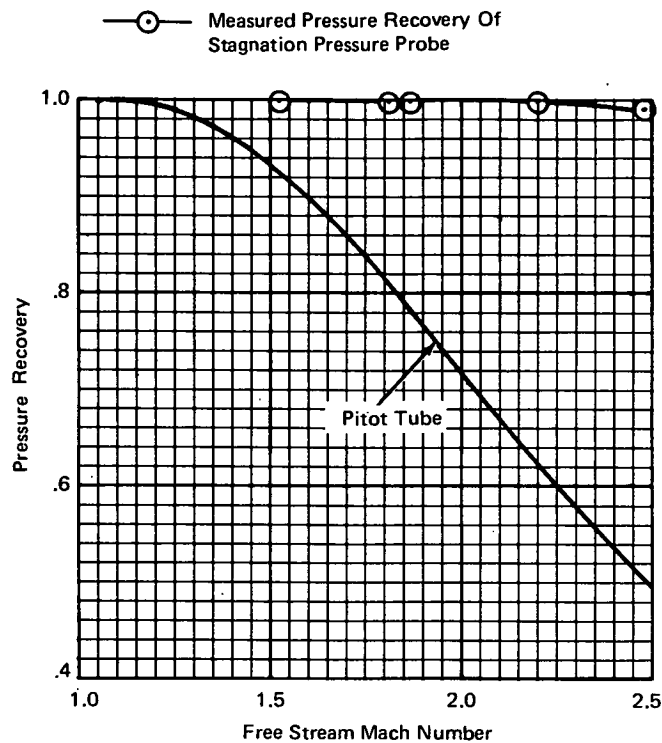


Figure 2. A Comparison Of The Pressure Recovery Of The Stagnation Pressure Probe With That of the Pitot Tube.

Note:

Requests for further information may be directed to:
 Technology Utilization Officer
 Langley Research Center
 Mail Stop: 139-A
 Hampton, Virginia 23365
 Reference: TSP72-10543

Patent status:

Inquiries concerning rights for the commercial use of this invention should be addressed to:
 Patent Counsel
 Langley Research Center
 Mail Code: 173
 Hampton, Virginia 23365

Source: Michael J. Goodyer
 Langley Research Center
 (LAR-11139)